





**IQRPE REVIEW  
OF  
HIGH-LEVEL WASTE (HLW) FACILITY ELEVATION -21'-0" HLW RADIOACTIVE  
LIQUID WASTE DISPOSAL (RLD) SYSTEM ANCILLARY EQUIPMENT**

"I, John T. Baxter, have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the High-Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste Disposal (RLD) System Ancillary Equipment as required by the Dangerous Waste Regulations, namely, WAC 173-303-640(3) applicable paragraphs, i.e., (a) through (g)."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design intent fully satisfies the requirements of the WAC.

The attached review is eleven (11) pages numbered one (1) through eleven (11).



24590-CM-HC4-HX YG-00138-02-00044, REV. 00A

John T. Baxter                      08/11/2004  
Signature                                      Date

**STRUCTURAL INTEGRITY ASSESSMENT OF THE  
HIGH-LEVEL WASTE (HLW) FACILITY ELEVATION -21'-0" HLW RADIOACTIVE  
LIQUID WASTE DISPOSAL (RLD) SYSTEM ANCILLARY EQUIPMENT**

**COGEMA-IA-069  
REV. 0**

**Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.**

Scope	Scope of this Integrity Assessment	This integrity assessment includes the ancillary equipment shown on the P&ID drawings listed below:
References	Drawings - P&ID	<p>24590-HLW-M6-RLD-P0001, Rev. 1, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Active Effluent Collection;</p> <p>24590-HLW-M6-RLD-P0002, Rev. 1, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Plant Wash &amp; Drains Vessel;</p> <p>24590-HLW-M6-RLD-P0003, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Decontamination Tank &amp; Sumps;</p> <p>24590-HLW-M6-RLD-P0004, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps;</p> <p>24590-HLW-M6-RLD-P0006, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Fluidics Air Rack RLD-RK-00023;</p> <p>24590-HLW-M6-RLD-P0007, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Fluidics Air Rack RLD-RK-00024 (Q);</p> <p>24590-HLW-M6-RLD-P0008, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps;</p> <p>24590-HLW-M6-RLD-P0014, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Offgas Drains Collection Vessel;</p> <p>24590-HLW-M6-RLD-P0015, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps;</p> <p>24590-HLW-M6-RLD-P0016, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps;</p> <p>24590-HLW-M6-RLD-P0017, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps;</p> <p>24590-HLW-M6-RLD-P20003, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Decontamination Tank &amp; Sumps - Melter 2;</p> <p>24590-HLW-M6-RLD-P20004, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps - Melter 2;</p> <p>24590-HLW-M6-RLD-P20005, Rev. 0, P&amp;ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps - Melter 2</p>

High Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste Disposal (RLD) System Ancillary Equipment		COGEMA-IA-069, Rev. 0
References	System Description and System Description Change Notices	24590-HLW-3YD-RLD-00001, Rev. 0, System Description for HLW Radioactive Liquid Waste Disposal (System RLD); 24590-HLW-3YN-RLD-00001, System Description Change Notice (SDCN) for 24590-HLW-3YD-RLD-00001, Rev. 0; 24590-HLW-3YN-RLD-00002, SDCN for 24590-HLW-3YD-RLD-00001, Rev. 0; 24590-HLW-3YN-RLD-00003, SDCN for 24590-HLW-3YD-RLD-00001, Rev. 0
	Plant Item Material Selection Data Sheets and Mechanical Systems Data Sheets	24590-HLW-N1D-RLD-P0002, Rev. 0, Plant Item Material Selection Data Sheet, RLD-BKPT-00007 & RLD-BKPT-00009 (HLW) Acidic Wash Transfer Breakpot; 24590-HLW-N1D-RLD-P0009, Rev. 0, Plant Item Material Selection Data Sheet, RLD-BRKPT-00004 (HLW) Wash Effluent Breakpot;
	Drawings – PFD	24590-HLW-M5-V17T-P0007001, Rev. 1, Process Flow Diagram HLW Vittrification Liquid Waste Effluent (System RLD) (Sheet 1); 24590-HLW-M5-V17T-P0007002, Rev. 1, Process Flow Diagram HLW Vittrification Liquid Waste Effluent (System RLD) (Sheet 2)

For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design controls and requirements to assure the design intent fully satisfies the WAC requirements.

### Summary of Assessment

High Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste Disposal (RLD) System Ancillary Equipment

COGEMA-IA-069, Rev. 0

Information Assessed	Source of Information	Assessment
<p><b>Design</b></p> <p>Ancillary equipment design standards are appropriate and adequate for the equipment's intended use.</p>	<p>Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-PSAR-ESH-01-002-04, Rev. 1A, Preliminary Safety Analysis Report (PSAR) to Support Construction Authorization; HLW Facility Specific Information</p>	<p>The Pipe Stress Design Criteria document identifies ASME B31.3 as the design code for piping systems of the WTP. Seismic Categories and Quality Levels vary among the ancillary equipment components. Ancillary equipment shown on the P&amp;ID drawings ranges from Seismic Category (SC-I), Quality Level (QL-1) to Seismic Category (SC-III), Quality Level (CM) (Commercial Material). Much of the ancillary equipment is Seismic Category (SC-II) and Quality Level (QL-2) as noted for example on P&amp;ID drawing no. 24590-HLW-M6-RLD-P0001 prior to entry into wallbox RLD-WBOX-00090. The Seismic Categories are explained in detail in the Pipe Stress Design Criteria document. Quality Levels are discussed in the PSAR. These codes and standards are acceptable and adequate for the design of the ancillary equipment for the intended service.</p>
<p>If the ancillary equipment to be used is not built to a design standard, the design calculations demonstrate sound engineering principles of construction.</p>	<p>24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers</p>	<p>The ancillary equipment is built to design standards. The Pipe Stress Design Criteria document specifies that piping is to be designed in accordance with ASME B31.3.</p>

Information Assessed	Source of Information	Assessment
<p><b>Design</b></p> <p>Ancillary equipment has adequate strength at the end of its design life to withstand the operating pressure, operating temperature, thermal expansion, and seismic loads. Equipment is protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction.</p>	<p>24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; Uniform Building Code (UBC), 1997 Edition, International Conference of Building Officials; ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NC, Appendix N and Appendix F, 1995; 24590-WTP-VV-PS-01-001, Rev. 2, Verification and Validation Report for ME101, Linear Elastic Analysis of Piping, Version N8</p>	<p>The Pipe Stress Design Criteria document requires the use of the ASME B31.3 Code for piping design. ASME B31.3 requires explicit consideration of many loadings including operating pressure, operating temperature, thermal expansion/contraction, settlement, vibration, and corrosion allowance in the design of piping. Elements of the ASME B&amp;PV Code, Section III, Division 1, Subsection NC, Appendix N and Appendix F are used to supplement the requirements of ASME B31.3 for seismic design of SC-I/SC-II piping. ASME B&amp;PV Code, Section III, Division 1, Subsection NC and Appendix F, and the Uniform Building Code (UBC) are used to supplement the requirements of ASME B31.3 for seismic design of SC-III/SC-IV piping. Details of the seismic design methods are discussed in the Pipe Stress Design Criteria document. Design is by hand calculations and computer codes that have been tested and approved as discussed in the Verification and Validation Report for ME101, Linear Elastic Analysis of Piping, Version N8. These are adequate and appropriate codes and standards to ensure that the ancillary equipment will have adequate strength at end of design life to withstand all anticipated loadings.</p>

High Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste Disposal (RLD) System Ancillary Equipment

COGEMA-IA-069, Rev. 0

Information Assessed	Source of Information	Assessment
<p><b>Supports</b></p> <p>Ancillary equipment supports are adequately designed.</p>	<p>Drawings - see references above;  24590-WTP-DC-PS-01-002, Rev 2, Pipe Support Design Criteria;  24590-WTP-PER-PS-02-001, Rev. 4, Ancillary Equipment Pipe Support Design;  ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers;  ASME Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Facility Components, Division 1, Subsection NF and Appendix F, 1995;  24590-WTP-PL-PS-01-001, Rev 1, Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs (PCFAPPS)</p>	<p>The Pipe Support Design Criteria considers all load types identified in ASME B31.3 and utilizes ASME Section III, Division 1, Subsection NF and Appendix F to supplement the requirements of ASME B31.3 for seismic design of SC-I/II and SC-III/IV pipe supports. Bounding load cases are passed to the pipe support designers from the results of the ancillary equipment piping stress analyses. Details of the seismic design methodology are discussed in the Pipe Support Design Criteria document. Analysis is by manual calculation and computer programs that have been tested and approved as discussed in the Verification and Validation Test Plan for Bechtel's ME150 Pipe Support Family of Programs (PCFAPPS). The Ancillary Equipment Pipe Support Design document shows examples of typical equipment supports. These are appropriate codes and standards for design of the RLD system ancillary equipment supports. Ancillary equipment supports are to be designed to allow a minimum of heat to be transferred to the building structures (building structures not to exceed 150 °F for concrete and 200 °F for steel).  Design standards for vessel internal equipment supports are discussed in the integrity assessment for the RLD system vessels.</p>



High Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste  
Disposal (RLD) System Ancillary Equipment

COGEMA-IA-069, Rev. 0

Information Assessed	Source of Information	Assessment
<p><b>Connections</b></p> <p>Seams and connections are adequately designed.</p>	<p>24590-WTP-DB-ENG-01-001, Rev 1B, Basis of Design; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications; ASME/ANSI B16.5, 1988 Edition, Piping Flanges and Flanged Fittings; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description</p>	<p>The Basis of Design states that in-cell piping that is non-maintainable will be fully welded. The Pipe Stress Design Criteria document specifies the ASME B31.3 Process Piping design code for the piping systems. Welding is to be performed in accordance with the requirements of ASME B31.3 and the ASME B&amp;PV Code, Section IX. Flange connections are to be designed in accordance with ANSI B16.5 as called out by piping material class. These are appropriate codes and standards for design and fabrication of the RLD system ancillary equipment.</p>
<p><b>Supports</b></p> <p>The system will withstand the effects of frost heave.</p>	<p>System Description listed above under References; 24590-WTP-DC-ST-01-001, Rev. 3, Structural Design Criteria</p>	<p>The ancillary equipment associated with the RLD system considered in this assessment is located in above and below grade process cells and caves inside the HLW Facility. The Structural Design Criteria requires that all structural foundations shall extend into the surrounding soil below the frost line to preclude frost heave. The frost line is 30 in. below grade. The HLW building foundations are not subject to frost heave; therefore, the ancillary equipment located inside the building is not subject to frost heave.</p>

High Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste  
Disposal (RLD) System Ancillary Equipment

COGEMA-IA-069, Rev. 0

Information Assessed	Source of Information	Assessment
<p>Waste Characteristics</p> <p>Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, temperature)</p>	<p>24590-WTP-PER-PR-03-002, Rev. 1, Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems; System Description and Process Flow Diagrams listed above under References</p>	<p>24590-WTP-PER-PR-03-002 provides discussion of confinement and control methods for the toxic vapor and emission characteristics. Design provisions for control of potential hazardous conditions associated with each HLW vessel and the associated ancillary equipment are listed in the System Description and 24590-WTP-PER-PR-03-002. The RLD System Description identifies the safety functions for ancillary equipment as to provide primary confinement of the wastes (Safety Design Class for RLD-VSL-00008 and Safety Design Significant for RLD-VSL-00007). Ancillary equipment associated with the Acidic Waste Vessel handles acidic and caustic liquids or vessel ventilation gases. Ancillary equipment associated with the Plant Wash and Drains Vessel handles caustic liquids or vessel ventilation gases. Ancillary equipment associated with the Offgas Drains Vessel handles caustic liquids or vessel ventilation gases.</p>

High Level Waste (HLW) Facility Elevation -21' -0" HLW Radioactive Liquid Waste Disposal (RLD) System Ancillary Equipment	COGEMA-IA-069, Rev. 0
---	-----------------------

Information Assessed	Source of Information	Assessment
<p>Waste Characteristics</p> <p>Ancillary equipment is designed to handle the wastes with the characteristics defined above and any treatment reagents.</p>	<p>24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; System Description listed above under References; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description; Plant Item Material Selection Data Sheets listed above under References.</p>	<p>The System Description indicates that the RLD system vessels RLD-VSL-00007, -00008, and -00002 collect acidic waste, plant wash and drains (caustic), and offgas drain liquids, respectively, from the submerged bed scrubbers, wet electrostatic precipitator, high efficiency mist eliminator, and various plant, vessel, and sump washes and miscellaneous radioactive drains. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment in contact with the waste will be equal to or better than the material and corrosion allowance of the waste source vessels except as noted therein. The RLD vessels and nozzles are fabricated of 316L stainless steel with the exception of vessel RLD-VSL-00007 with a shell and nozzles of AL-6XN (6% Mo) due to the acidic nature of the materials handled within this vessel. The Piping Material Class Description lists 316L stainless steel as the material selection for most of the RLD system ancillary equipment. Acidic process inflows to RLD-VSL-00007 from the SBS and SBS condensate receiver vessels are in Hastelloy C-22 piping, while all other process lines to and from this vessel are AL-6XN except for breakpot overflows fabricated of 316L. Reagents are normally added to the RLD system ancillary equipment during normal operations to neutralize acids in RLD-VSL-00007. Breakpots RLD-BRKPT-00007 &amp; -00009 are to be fabricated of 316L while RLD-BRKPT-00004 is to be 304L Stainless Steel. These material specifications indicate that the ancillary equipment is designed to handle the identified wastes.</p>

High Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste  
Disposal (RLD) System Ancillary Equipment

COGEMA-IA-069, Rev. 0

Information Assessed	Source of Information	Assessment
<p><b>Compatibility</b></p> <p>The pH range of the waste, waste temperature and the corrosion behavior of the structural materials are adequately addressed. Ancillary equipment material and protective coatings ensure the ancillary equipment structure is adequately protected from the corrosive effects of the waste stream and external environments. The protection is sufficient to ensure the equipment will not leak or fail for the design life of the system.</p>	<p>System Description and Plant Item Material Selection Data Sheets listed above under References; 24590-WTP-DB-ENG-01-001, Rev 1B, Basis of Design; 24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; 24590-WTP-3PS-NN00-T0001, Rev 0, Engineering Specification for Hot and Anti-Sweat Thermal Insulation</p>	<p>The Basis of Design identifies a service design life of 40 years for the ancillary equipment. All non-maintainable items will be designed to last the life of the facility. Detailed material selection (corrosion) analyses are conducted for each vessel and major components in the radioactive liquid waste disposal system in the HLW facility during process design. The Materials for Ancillary Equipment document requires that the material selection and corrosion/erosion allowances for ancillary equipment in contact with the waste will be equal to or better than the material and corrosion allowance of the waste source vessels except as noted therein. The Thermal Insulation specification requires that all insulating materials used on the outside of ancillary equipment be pre-approved for use on austenitic stainless steel in accordance with applicable ASTM procedures and tests to preclude external corrosion of ancillary equipment. Corrosion allowances are considered for all ancillary equipment, therefore, the ancillary equipment will provide the expected design service life.</p>

High Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste Disposal (RLD) System Ancillary Equipment

COGEMA-IA-069, Rev. 0

Information Assessed	Source of Information	Assessment
<p><b>Corrosion Allowance</b></p> <p>Corrosion allowance is adequate for the intended service life of the ancillary equipment.</p>	<p>Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-DB-ENG-01-001, Rev 1B, Basis of Design; 24590-WTP-PER-M-02-002, Rev 1, Materials for Ancillary Equipment; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description</p>	<p>The Pipe Stress Design Criteria document requires use of the ASME B31.3 Code for ancillary equipment design. Consideration of corrosion, including corrosion allowance, is a mandatory requirement of ASME B31.3. A required service design life of 40 years is identified in the Basis of Design for ancillary equipment located in inaccessible process cells. Detailed material selection (corrosion) analyses are conducted for each vessel and major components in the RLD systems in the HLW Facility during process design. The Materials for Ancillary Equipment document requires that downstream ancillary equipment is to be constructed of equal or better materials than the source vessel and with the same corrosion allowance as the source vessel, except as noted therein. Bounding corrosion allowances are listed for each piping material class in the Piping Material Class Description document and are adequate for the intended service life of the ancillary equipment.</p>
<p><b>Strength</b></p> <p>Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessels are exceeded.</p>	<p>Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description</p>	<p>The Pipe Stress Design Criteria document specifies use of ASME B31.3 as the design code for the WTP piping. ASME B31.3 requires provision be made to safely contain or relieve any pressure to which the piping may be subjected. ASME B31.3 piping not protected by a pressure relieving device, or that can be isolated from a pressure relieving device must be designed for at least the highest pressure that can be developed. Bounding pressure and temperature limits are listed for each of the piping material classes in the Piping Material Class Description document.</p>

High Level Waste (HLW) Facility Elevation -21'-0" HLW Radioactive Liquid Waste Disposal (RLD) System Ancillary Equipment

COGEMA-IA-069, Rev. 0

Information Assessed		Source of Information	Assessment
<b>Strength</b>	Maximum flows and any unusual operating stresses are identified	Drawings listed above under References; 24590-WTP-DC-PS-01-001, Rev. 3, Pipe Stress Design Criteria including "Pipe Stress Criteria" and "Span Method Criteria"; ASME B31.3 Code, Process Piping, 1996 Edition, American Society of Mechanical Engineers; 24590-WTP-PER-PL-02-001, Rev. 5, Piping Material Class Description	The expected flow paths for the ancillary equipment are identified on the P&ID drawings. The Pipe Stress Design Criteria document specifies the ASME B31.3 code for piping design. This code requires piping to be designed to the highest pressure that can be developed in a piping system assuring that maximum operating stresses remain within code allowables. The Piping Material Class Description document lists the bounding pressure and temperature limits for each piping material class.
<b>Secondary Containment</b>	Ancillary equipment is designed with secondary containment that is constructed of materials compatible with the waste and of sufficient strength to prevent failure (pressure gradients, waste, climatic conditions, daily operations), provided with a leak-detection system, and designed to drain and remove liquids.	Drawings and System Description listed above under References	The ancillary equipment considered in this assessment is located in above and below grade process cells and caves inside the HLW Facility. Secondary containment for ancillary equipment within the cells and caves is provided by the liners and sumps in these areas, as appropriate, and is considered to be outside the scope of this integrity assessment.